MARTEM
KAUGJUHTIMISSÜSTEEMID
TELECONTROL SYSTEMS

RTU DIGITAL INPUT MODULE TELEM-DI20G
User manual

Martem AS
2009

Preface

This document, User Manual edition 1.0 for RTU Digital Input Module TELEM-DI20G version 1.0, provides a general technical description of the module, configuration and use. Although we have carefully checked the contents of this publication for conformity with the hardware and software described, we cannot guarantee complete conformity since errors cannot be excluded**.** The information provided in this manual is checked at regular intervals and any corrections which might become necessary are included in the next releases. Any suggestions for improvement are welcome.
The RTU Digital Input Module TELEM-DI20G has been designed and manufactured according to the quality principles of ISO 9001.
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Contents

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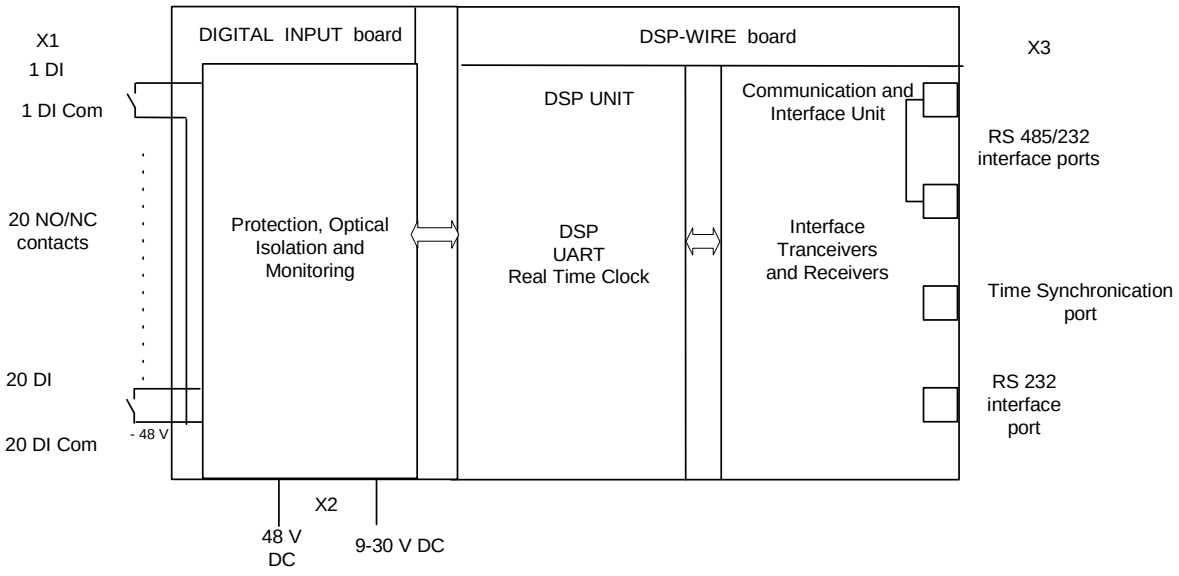
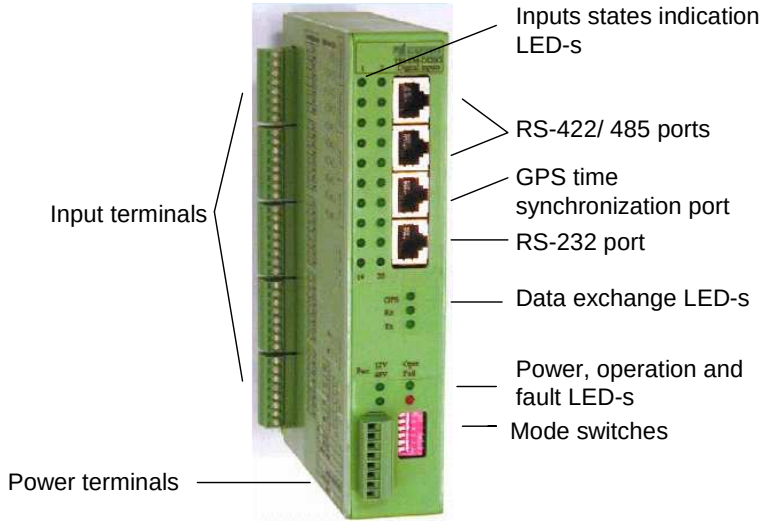
1. Application

TELEM-DI20G digital input module is used for digital contact info acquisition, pulse counting and data excange with higher level devices or systems. Its functionality allows it to be used flexibly in systems for distributed process automation to determine status of the different objects or as a pulse counter, where reliable information acquisition and excellent noise immunity with respect to environmental and electromagnetic influences are important. It may be used as standolone device or in daisy-chain connection with other modules.

2. Construction

The mechanical design is based on plastic terminal modules that can be readily mounted on
35-mm rails. It contains universal for TELEM family modules DSP-WIRE board and DIGITAL INPUT board.





3. Features

- GPS time synchronization with 1 ms accuracy
- Two level input filters
- Binary signals are recorded with a time resolution of 1 ms
- Buffer depth for each time tagged input >= 45
- Online leased line or offline dial-up mode operation, data GSM communication request by event in substation or by remote control centre
- Logical operation between inputs can be compiled
- Configuration / parameterization with IEC protocol at the same line with data communication
- Daisy- chain master – slave connection of 30 modules is possible using RS 232/422 interface
- Self diagnostics and supervision simultaneously with data acquisition

4. Technical data

Input

Number of independendly configurabe isolated digital inputs	20

Power requirements

Supply voltage	9-30 V DC, 4 VA 48V –10/+25%, DC Isolated for contact info circuits
Fuse protection	9-30 V (not replaceable) 0,5A, time-lag 48V (not replaceable) 0,5A, time-lag

Installation, terminals and environment

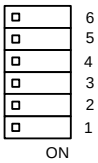
Enclosure (wxhxd)	38x174x127
Weight	0,4 kg
Mountable	DIN 35
Plug connector for digital input	Phoenic MC1,5/8-ST-3,5
Plug connector for power	Phoenic MCVW1,5/8-ST-3,5
Terminals for communication	RJ45
Over voltage protection	IEC-60255-4, 5 kV pulse protection IEC-60255-5, 2 kV DC
Ambient temperature in operation	–20…+50℃

Disturbance

Emission	EN-55022A
Static discharge	EN-61000-4-2
Fast transients	EN-61000-4-4
Surge	EN-6100-4-5
Conducted HF field	EN-61000-4-6
Emitted HF field	EN-5022BB

5. Mode switches

Mode of operation and type of interfaces is detemined using switches on the DSP-Wire board



1. ON- reset the device
2 OFF – operation mode, ON firmware load mode
3. ON – restore default setup
4 Not used
5. ON - Master mode operation, OFF - Slave mode operation
6 . ON – Ports1 and 2 interface RS -485, OFF Ports 1 and 2 interface RS – 422

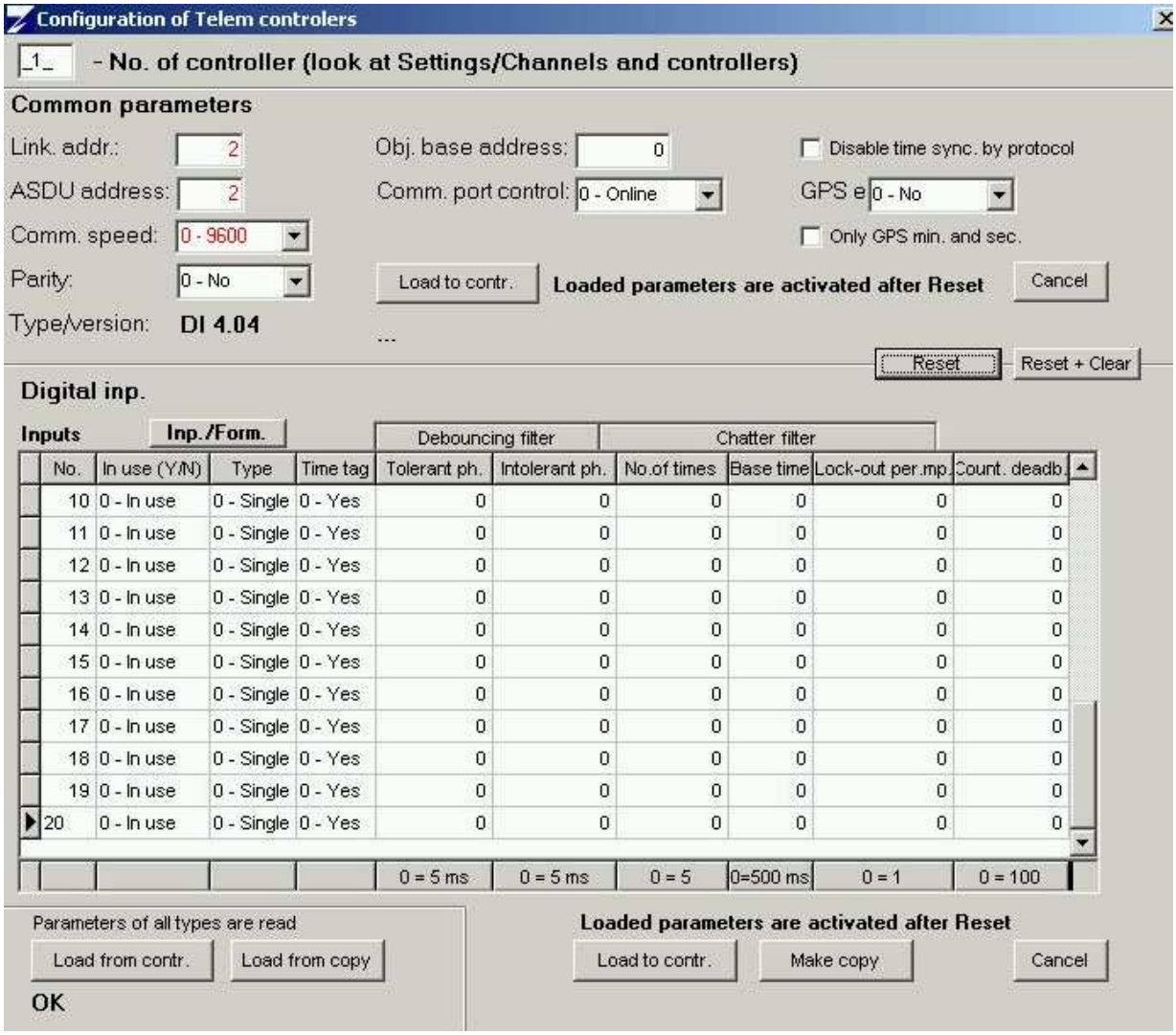
6. Communication

• Transmission rate	200…38400 bit/s
• Communication mode	asynchronous data bits 8, parity N, stop bits 1
• Communication interface	RS232, selectable RS422 or RS485
• Communication protocol	IEC60870-5-101 slave/master, unbalanced
• Link address length	1 byte
• ASDU address length	2 byte
• Object address length	2 byte
• GPS time synchronization input	9600 bps (RS422/485 RX),
• Time synchronization protocol:	ASCII (Motorola), device TLM-
• Communication interface isolation	optically to 2,5kV RMS

7. Configuration parameters for digital inputs

TELEM 20G module is configurable by Telem-2000 RTU configuration software or other configuration software using data exchange protocol IEC60870-5-101. Telem-2000 RTU configuration software runs under the Windows -95or later operating systems on any standard PC, communicates via COM interface and performs the following principal functions:

- Configuration / parameterization of telecontrol substations
- Back up of RTU configuration data



TELEM-DI20G configuration tab card

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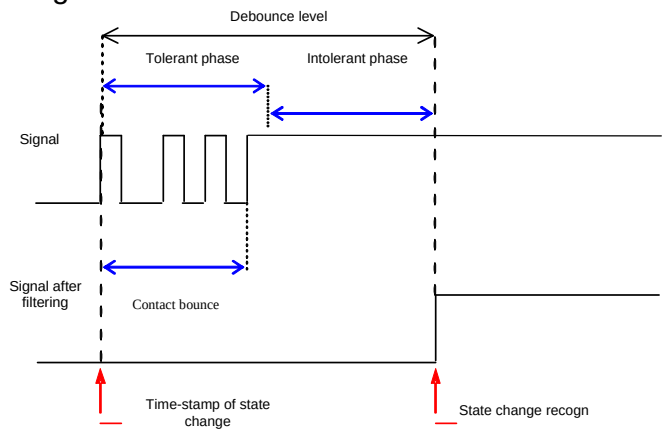
Parameter	Value	Default value
General		
1. In use	Yes No	Yes
2. Single- or double signal or counter input [In case of double signal the next input is used for second signal]	Single Double	Single
3. Time tagged	Yes No	Yes
Debouncing filter		
4. Tolerant phase [A period of time during which changes of state are permitted and ignored on a digital input signal]	1-255 ms.	5 ms (0)
5. Intolerant phase [A period of time during which the state of a digital input must remain constant]	1-255 ms.	5 ms (0)
Chatter filter [A facility that is used to disable a digital input point if the number of state changes of that point during a defined time interval is excessively high]		
6. Chatter times [changes]	1-255 times	5 (0)
7. Filter base [defined time interval]	0-32000 ms.	500 ms (0)
8. Lock-out period multiplier [Number of filter base periods when the chatter filter will be on]	1-255 periods	1
Counter		
9. Number of pulses for creating an event [Counter event is always without time tag]	1-255 pulses	100 (0)

Digital input processing

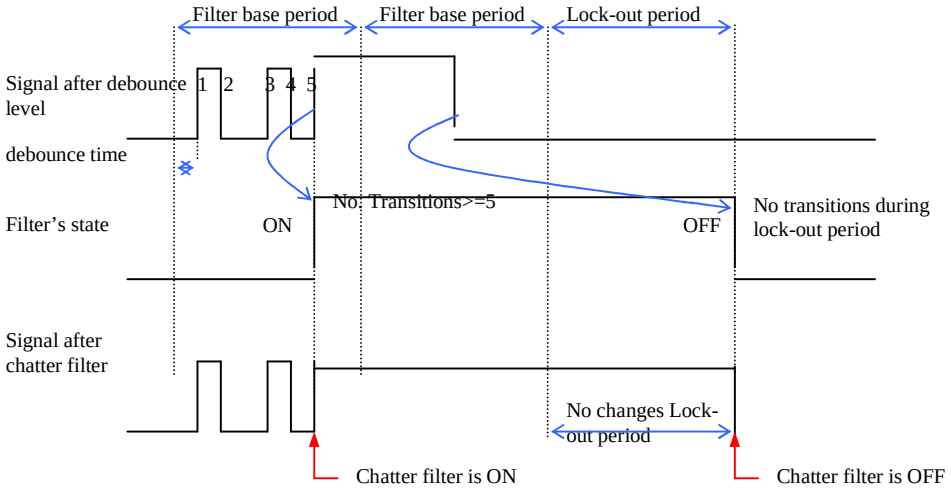
Debouncing filter

Tolerant phase: A period of time during which contact bounce is “acceptable”. Having a tolerant period allows you to monitor and time-stamp the initial state of change, while ignoring any subsequent contact bounce.
Intolerant phase: A period of time following the tolerant phase during which contact bounce is not “acceptable”. It ensures that contact bounce is not mistaken for a valid change of state.

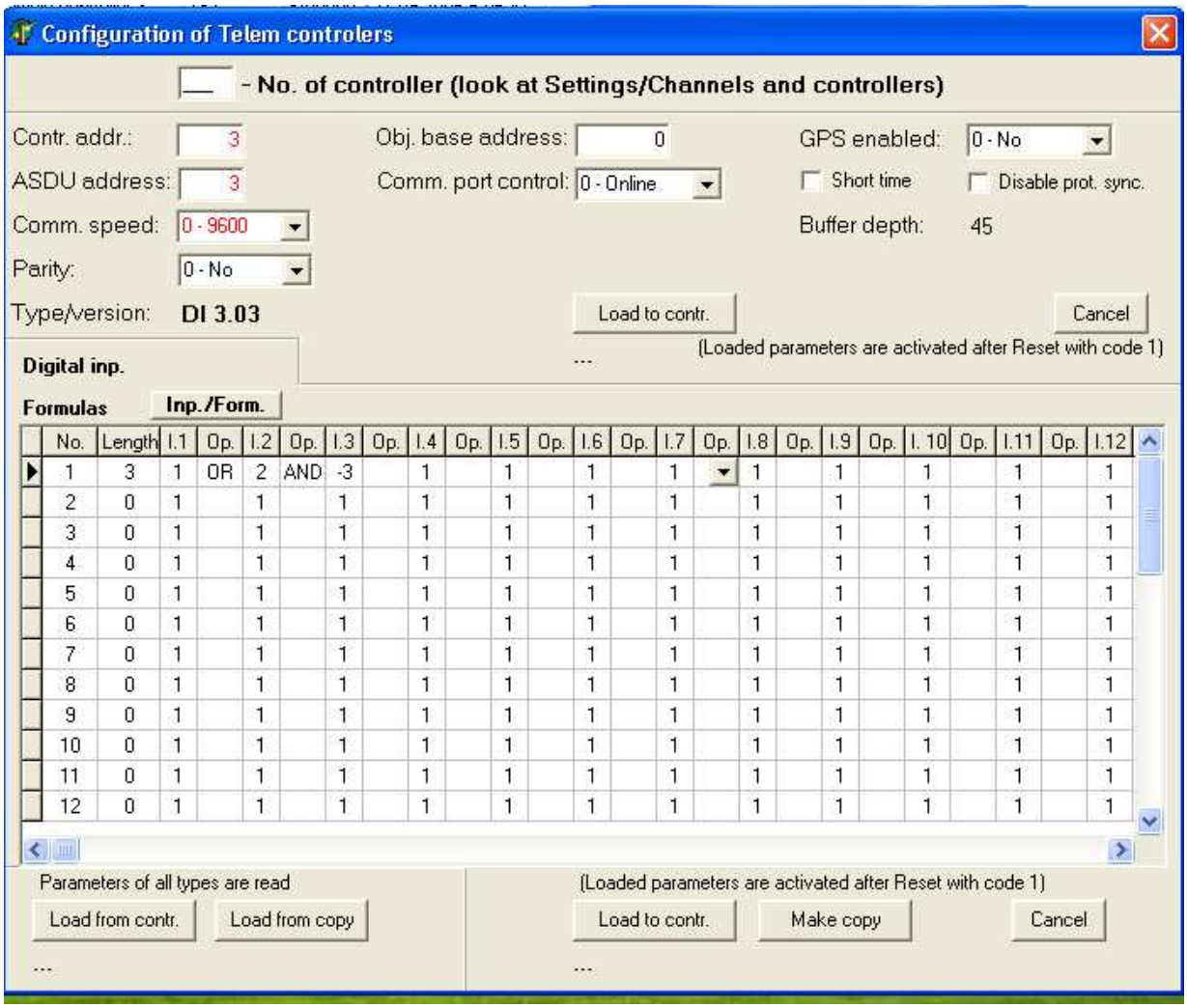


Chatter filter

Chatter times (changes): The maximum allowable number of state transitions that can occur within a filter base period. If the number of state transitions during a filter period equals or exceeds the maximum allowable number of state transitions, chatter filter will turn ON, and any further transitions will be ignored for the duration of the “lock-out” period.
Lock-out period: The minimum number of filter base periods during which the chatter filter will remain ON. The chatter filter can proceed from ON to OFF only if no state transitions are detected for an entire lock-out period.
Example: Chatter times (changes) 5, Lock-out period 1



8. Logical operations with digital inputs



TELEM-DI20G Formulas Tab Card

It is possible to configure the formulas where inputs are combined with NOT, AND, OR and XOR operations.
In case of using formulas every formula occupies one IEC protocol object address of inputs (substitutes the input).

By default the IEC objects and inputs are bound with following formulas:

Y1 = X1
Y2 = X2
…Y24 = X24 Where X is input and Y is the calculated value.

9. Connection to signal lines

Digital input signals terminals layout

X1

Signal		Pin
1 DI +		1
1 DI Com		2
2 DI +		3
2 DI Com		4
3 DI +		5
3 DI Com		6
4 DI +		7
4 DI Com		8
5 DI +		9
5 DI Com		10
6 DI +		11
6 DI Com		12
7 DI +		13
7 DI Com		14
8 DI +		15
8 DI Com		16
9 DI +		17
9 DI Com		18
10 DI +		19
10 DI Com		20
11 DI +		21
11 DI Com		22
12 DI +		23
12 DI Com		24
13 DI +		25
13 DI Com		26
14 DI +		27
14 DI Com		28
15 DI +		29
15 DI Com		30
16 DI +		31
16 DI Com		32
17 DI +		33
17 DI Com		34
18 DI +		35
18 DI Com		36
19 DI +		37
19 DI Com		38
20 DI +		39
20 DI Com		40 — - 48 V

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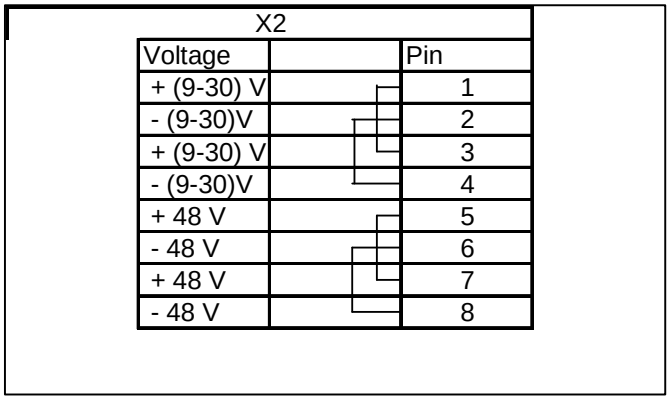
10. Connection to power supply



11. Communication ports pin layout

X3		
Port	Signal	Pin
X 3-1 RS -422/485	+ CTS	1
	-CTS	2
	+RTS	3
	-RTS	4
	+RX	5
	-Rx	6
	+TX	7
	-TX	8
X 3-2 RS -422/485	CTS	1
	-CTS	2
	+RTS	3
	-RTS	4
	+RX	5
	-Rx	6
	+TX	7
	-TX	8
X3 -3GPS RS-422/485	+RX	1
	-RX	2
		3
	GND	4
	GND	5
		6
	-RX	7
	+RX	8
X 3-4 RS -232		1
	CTS	2
	GND	3
	RXD	4
	TXD	5
	FGND	6
	RTS	7
		8

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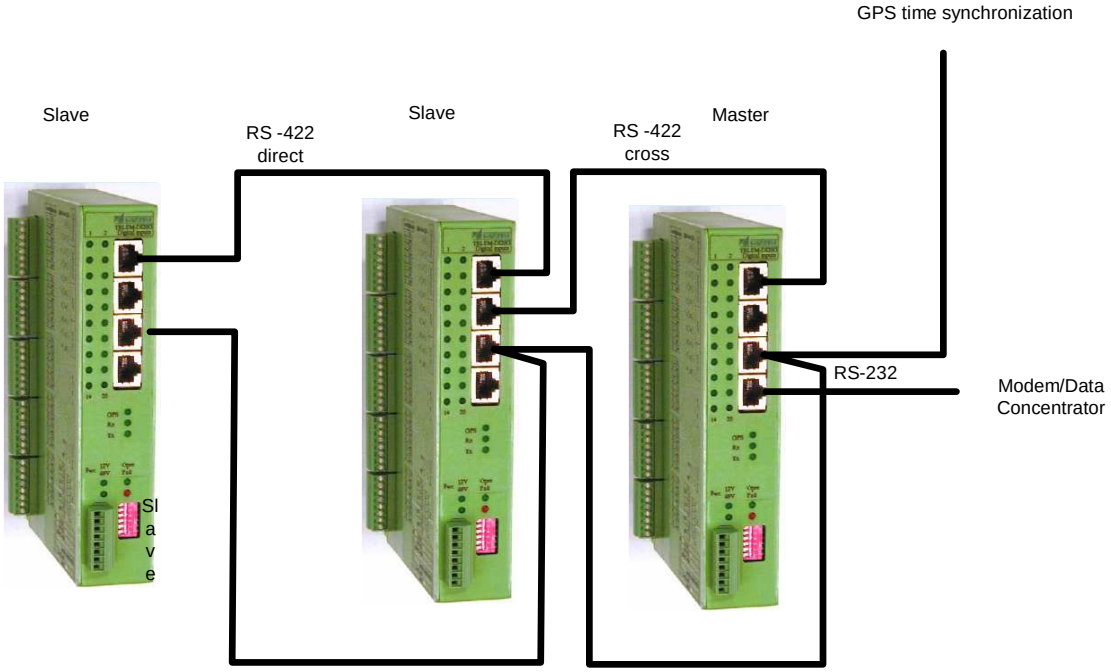
12. Connection example



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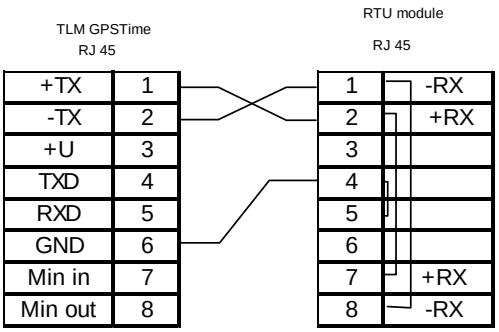
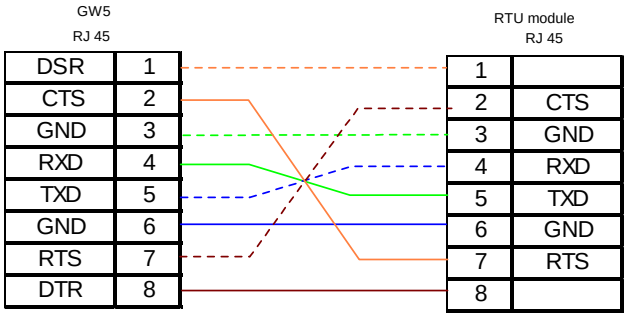
13 . Connection cables

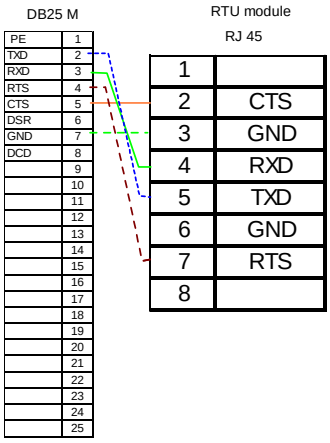
RTU module-GPSTime connection



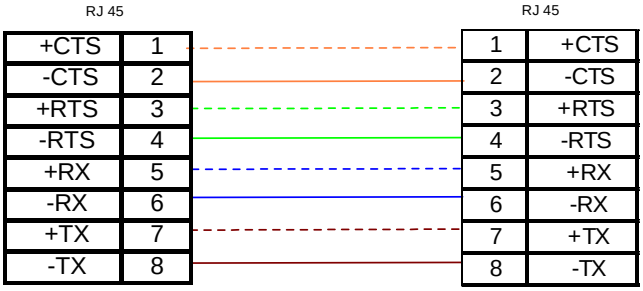
Data contcentrator-RTU module connection



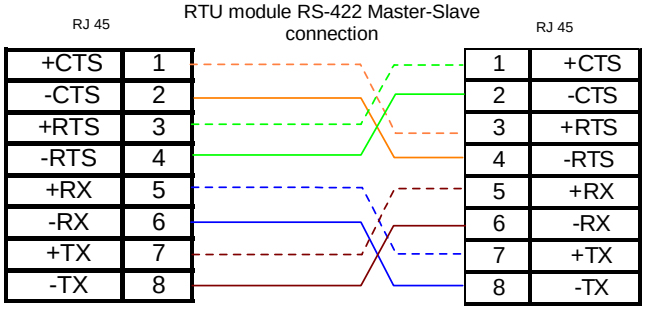
RTU module- modem connection



RTU module RS-422 Slave-Slave connection



RTU module RS-422 Master-Slave connection



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